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DESIGNING AN ENERGY STATISTICS ROADMAP: A GUIDE TO STRENGTHENING NATIONAL CAPACITIES FOR TRACKING ENERGY TRANSITIONS

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Abstract

Energy is a priority policy area in all countries, given its importance for climate change, but also for economic development, security, and more generally quality of life. Integration of energy statistics within national statistical strategies is therefore essential for effective decision-making, even more as it is often driven and sometimes handled by entities other than national statistical offices, such as ministries or energy agencies. Establishing or reinforcing a national energy information system requires for instance a sound data governance and effective institutional and legal arrangements at national level. The IEA is releasing a Guide to support countries to design their energy information system - the guide, accompanied by a self-assessment tool, is based on a consultation of country experts worldwide and provides a framework highlighting all key steps to be taken, in the form of a roadmap, from planning to institutional setup to tracking. With this guide and the associated training material, the IEA aims at assisting countries in the continued development of their national energy information systems, regardless of their resource availability and maturity level. The framework is expected to be used as a tool to facilitate the development of strategic action plans and resource allocation to strengthen national energy data capacities – key elements of effective energy and climate policies.

I. ENERGY TRANSITIONS REQUIRE SOUND DATA CAPACITIES

1. Accurate, timely and transparent energy statistics are the basis of energy policy and planning. Reliable energy data are increasingly important for monitoring transitions toward more sustainable energy systems and for tracking progress in tackling one of the biggest global challenges: climate change.

2. Over the years, the International Energy Agency (IEA) has been taking an active part in developing methodologies for collecting and reporting energy statistics. Since 2012, through its capacity building programs, the IEA has trained more than 1 000 energy statisticians, practitioners and data users working in national administrations, both in person and online. While the international energy and climate community may provide support to countries, the important work of collecting and developing national energy statistics remains the responsibility of individual government administrations.

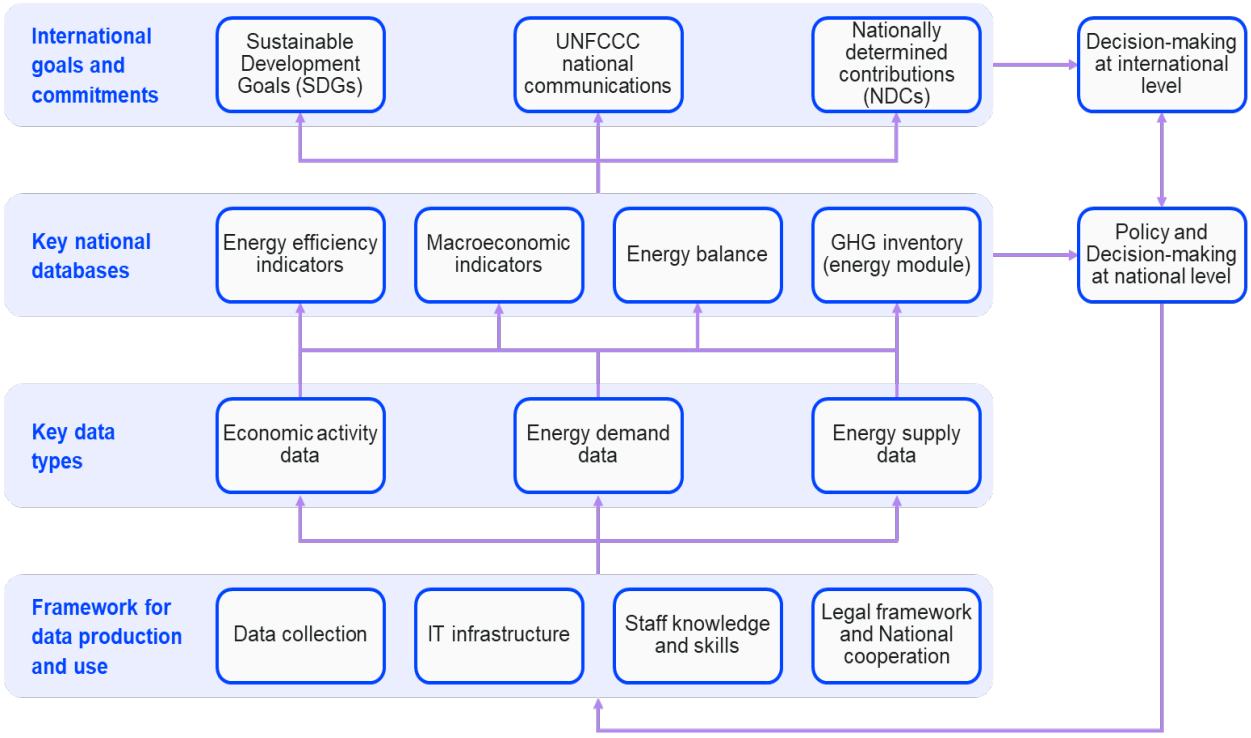
3. To further strengthen national capacities for producing the information needed to inform energy analysis and policies, the IEA has developed a Guide to support countries *(Designing an energy statistics roadmap. A guide to strengthening national capacities for tracking energy transitions,* hereafter "the IEA Guide"*)*, to identify the areas to be strengthened in national systems for energy data collection, production and dissemination -- thereby facilitating the development of action plans. While the quality of energy data can be measured by

parameters such as timeliness and accuracy, it is important to also assess its suitability for supporting national energy policy processes.

4. The IEA Guide draws on the quality frameworks developed for general cross-sectoral statistics, on worldwide best practices for strengthening energy statistics and on the IEA's experience with international collaboration. It was developed with the contribution of, and peer-reviewed by, several national energy data providers, to ensure that it properly encapsulates the key challenges that countries may face. It is also complemented by an Excel tool that allows national stakeholders to perform a qualitative assessment of their country's energy information system. While the broader policy assessment and evaluation (based on the data) is outside the scope of the document, it would need of to be reflected in a general energy data strategy.

5. The guide focuses on annual energy supply and demand data at the national level and considers data collection as a key pillar for analysis and decision-making. As illustrated by the complexity of Figure 1, responsibility for collecting data is often distributed across several national stakeholders. Due to this distributed arrangement, stakeholders may not have full visibility on existing issues of the national energy data system, which hinders active cooperation to mitigate them.

Figure 1: **Data and policy links for tracking energy transitions**



II. A FRAMEWORK FOR DEVELOPING NATIONAL ENERGY STATISTICS

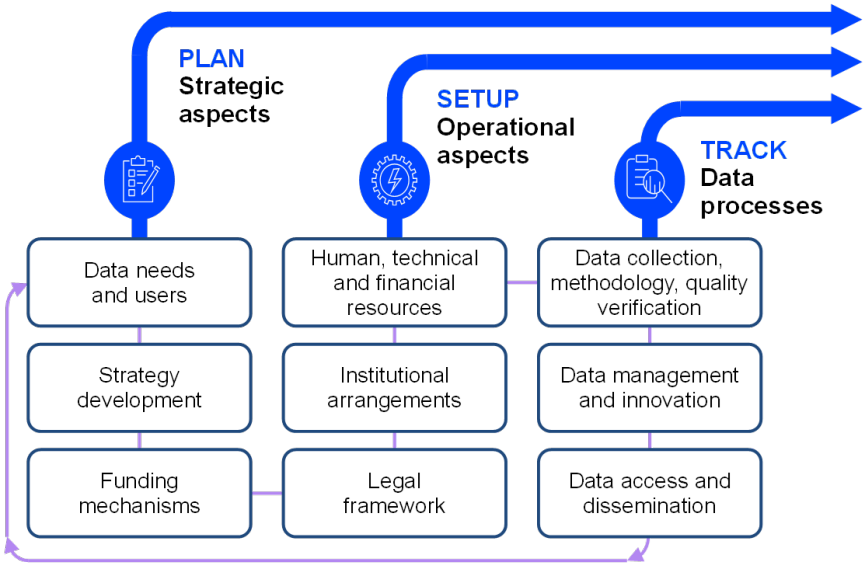
6. Several broad-scope guidelines aimed at national statistical offices (NSOs) have already been published, including those produced by the United Nations (e.g. the Handbook of Statistical Organization), as well Eurostat, the statistical office of the European Union (e.g. European Statistics Code of Practice).

7. Within the sectoral energy domain, there are relevant resources and guidelines for the development of statistics, such as the IEA Energy statistics manual, and the UN's International Recommendations for Energy Statistics (IRES). Nonetheless, there may not always be alignment with international guidelines for several reasons, including a lack of awareness from institutions or a misalignment between national and international data gathering methods and standards.

8. More importantly, despite the wealth of methodological guides available, few guidelines exist that focus on energy data strategies more generally or identify pathways for producing robust energy data. The IEA Guide aspires to fill this gap by providing a framework for the assessment and development of national energy statistics, to support energy data providers and related national institutions. This framework is structured into three core dimensions, each including three main components (Figure 2): i) PLAN – Strategic aspects; ii) SETUP – Operational aspects; iii) TRACK – Data processes.

9. While national circumstances may vary, we consider all three dimensions, and each component within, to be universally relevant. The guide provides concrete examples of the application of this conceptual framework to the energy statistics domain. For example, within the "TRACK - data collection" component, the Guide describes typical sources and methods to collect relevant information for the key variables of an energy balance, such as energy production, trade, energy transformation and final consumption by sector. The three dimensions are briefly presented in the sections below.

Figure 2: **The IEA Guide's conceptual framework to assess and develop energy statistics ("roadmap")**



A. PLAN: The strategic dimension

10. This refers to the strategic preparedness of a national energy statistics system to address current and future data needs. Preparedness is strongly tied to the ability to map data needs, knowing the key data producers and users, as well as the ability to plan (both in the short and long term) for further development of national energy statistics (e.g. for a particular energy product or sector). A key part of this dimension is the development of an overarching strategy and the identification of potential funding mechanisms to sustain the energy information system.

11. The PLAN dimension includes the following components: Data needs and users; Strategy development; and Funding mechanisms.

B. SETUP: The operational dimension

12. This involves assessing the operating environment of the national energy statistics system: the underlying legal framework as well as existing institutional arrangements and resources. Limitations in these aspects will most likely impact the tasks related to the data processes.

13. The SETUP dimension includes the following components: Human, technical and financial resources; Institutional arrangements; and Legal framework.

C. TRACK: The data processing dimension

14. This dimension considers the overall data flows, starting with the collection of primary data (e.g. surveys), to its dissemination and final use. It is important that data are collected applying appropriate methodologies, and if need be, complemented with alternative and/or innovative data sources. Once the data are systematized and ready for dissemination, open and user-friendly access to the final information should be provided for a diversity of users.

15. The TRACK dimension includes the following components: Data collection, methodology and verification; Data management and innovation; and data access and dissemination.

III. A GUIDE TO SHARE EXPERIENCES ACROSS COUNTRIES

16. The IEA Guide is based on desk research and interviews of data experts from across countries worldwide. To complement the description of the assessment framework above, the Guide includes: the description of national energy statistics framework for selected countries; and, for each component of the roadmap: national case, guiding questions to facilitate self-assessment, best practices for short- and long-term action; and finally, it is complemented by an Excel tool for self-assessment.

A. Description of national systems for selected countries

17. The IEA Guide includes summaries of all the interviews conducted during the consultation consisting of the description of the key components of the roadmap for around fifteen countries (see excerpt for one country in Table 1).

Table 1: **Excerpt of a country summary (Ethiopia) from the Annex of the Guide.**

PLAN	Strategic aspects of the framework
Data needs and users	Energy data are collected to produce annual statistics. However, some gaps exist as the available data are not enough to fully inform policy makers or for planning. Data are not robust enough as they need strengthening for accuracy and completeness. Additional data requests outside of regular data collection are collected and assessed on case-by case basis to see how these data could be collected. For instance, a query can be sent to the utilities to see if such data exists, and if it is, then a tool can be developed to capture that data.
Strategy development	There is no written long-term data strategy, but it would be good to create one. There is a need to work more closely with the Ethiopian Statistical Service (ESS) to include questions on energy supply and consumption data requirements in their welfare monitoring surveys (which are conducted every 5 years). Also, a long-term objective is to work on automation and to develop an online data repository. Data are currently input manually, but work is ongoing to develop an only reporting platform through a consultancy. The National Energy Database and Information System (NEDIS) is valuable for storing energy data in sustainable manner. Due to technical and financial issues, the NEDIS has not been operational since March 2024.
Funding mechanism	No internal budget is allocated for financing surveys, so there is heavy reliance on external funding from many development partners. However, national human capacity exists to conduct and process surveys. In 2018, the World Bank financed a multi-tier access survey. (Link) In 2020, International Renewable Energy Agency (IRENA) financed a first pilot survey for two regions, involving 275 households, at a cost of USD 50 000. The sample size may not be sufficient for a full-fledged survey, however. IRENA provided an additional USD 50 000 to repeat the survey in two additional regions. Although conducted by local energy experts, the survey was designed by the Food and Agriculture Organization and provided to them by IRENA. It was slightly modified to fit local needs. It is difficult to allocate sufficient resources for conducting censuses.

	In 2022, IRENA also financed a second pilot survey for one region and one city administration involving 500 households, at a cost of USD 50 000. However, it is still not enough to represent the entire residential sector, and there is a need to conduct a nationwide household survey.
SETUP	**Operational aspects of the framework**
Legal framework	A proclamation tasks the Ministry of Water and Energy with collecting data and defines its related tasks. As a result, the department responsible for the collection – the energy database and modelling desk – was restructured to better carry out the tasks.
Institutional arrangements	The ministry coordinates the work and collects energy data in close cooperation with the ESS. In the future, the ESS may be tasked to amend some of their surveys to cover more energy-related topics (e.g. welfare monitoring survey every five years). A memorandum of understanding (MoU) is currently being prepared between the ministry and the ESS that will allow complementary energy data collection using ESS surveys. There is a working group of ministry and ESS experts to discuss how to deepen cooperation. There is also regular communication among energy utilities, large importers, the Ministry of Mines and the Ministry of Industry. There is a mapping of stakeholders. So far there has not been collaboration with the Ministry of Health, but such cooperation could grant access to air pollution and clean cooking data. Dialogue also takes place with academic institutions and think tanks. Energy efficiency is the responsibility of the Ethiopian energy efficiency agency, with whom the ministry communicates and shares data.
Human, technical, and financial resources	The regular collection of energy data is funded from the government budget and has the human capacity required, i.e., the system is established. Running new surveys will require additional and/or external funding, as well as the planned cooperation from the ESS.
TRACK	**Data processes of the framework**
Data collection, methodology and quality verification	Currently the data being collected covers electricity (public utility), biomass (incomplete) and hydrocarbons (all imported). There is data available for commercial fuels data that is easy to access (e.g. customs), but demand data suffers from accuracy issues. The main data gaps are on the demand side, particularly for biomass. The picture of coal consumption is also incomplete. No survey exists to capture the full energy consumption of industries (the only data available are for the electricity sector). Regular data collection is established, but the ministry can conduct additional demand surveys only if external funding is available. Currently data are exchanged on request, via email. A data portal was created to facilitate data exchange, but it is not operational due to technical issues. In the future, the objective is to revive and/or redesign this portal. International standards are applied to the collected energy data. While there is no established system for assessing data quality, data are cross-checked against alternative sources. A future data portal would ideally have some automatic data-quality controls.
Data management and innovation	
Data access and dissemination	The database is in the process of development to make information available online (as of July 2022).

B. Case study descriptions

18. For each of the nine components of the framework (e.g. “PLAN – Data users and data needs”; etc), the Guide provides a concrete example of implementation in a given country, as shown in Box 1 for the component: “TRACK – Data collection, methodology and quality verification”.

Box 1: **Example of case study for Kazakhstan ("TRACK – methodologies and standards")**

Case study: Aligning energy data collection with international standards in Kazakhstan.

Kazakhstan's official energy data, which previously included large inconsistencies and statistical discrepancies, and was published in a challenging format, has undergone significant improvements under the so-called EU4Energy programme. This initiative is funded by the EU and implemented by the IEA.

The process helped identify the root causes for many of the country's data issues. Primary data collection methods – some of which dated to the Soviet era – were inadequate for capturing the specifics of the energy sector. Survey forms did not distinguish energy sector respondents from manufacturing enterprises. This led to double counting of energy transformation inputs and outputs in some cases, while in others, some data flows relevant for energy transition policy were not captured at all.

The entity responsible for producing official national energy information took charge of revising the data collection forms. With the help of external expertise and piloting the revised forms with the main energy industries, Kazakhstan started using the revised methodology in 2021. The newly acquired data was more complete and, most importantly, it eliminated some of the previously observed statistical differences. The minor data issues that remain will be addressed in subsequent collection cycles. The new information significantly improves the compilation of the national energy balance, greenhouse gas inventory and energy modelling activities in Kazakhstan.

It is also worth noting that consolidating energy supply and demand statistics within a single team under capable management was an important factor enabling the entity responsible for producing official national energy information to do its work.

C. Practical short-term and long-term "best practices"

19. The Guide also includes, for each component of the framework, concrete "tips" based on the experience of data experts from across countries. Some have been categorised as "low-hanging fruit", while some others may require more "medium term" planning. For example, within "SETUP – Institutional arrangements", best practices point to the need for coordination within NSOs, energy and climate stakeholders.

Table 2: **Examples of best practices for the component of "SETUP - Institutional arrangements"**

Best practices
Low-hanging fruit
☐ The entity responsible for producing official national energy information is in frequent communication with national stakeholders to facilitate data exchanges and control data quality
☐ If the entity responsible for producing official national energy information is different than the NSO, they coordinate their energy data collection and dissemination activities
☐ If responsibility for international reporting falls to different entities (e.g. energy vs. climate), they coordinate their work to harmonize information.
Medium-term goals
☐ There is a dedicated entity for coordinating energy statistics activity, with sufficient mandate and tools to collect and disseminate energy information (See also "Legal framework")
☐ Responsibility for compiling and publishing energy statistics, energy balances, and energy efficiency data is clearly defined
☐ There is a dedicated aggregator at the national level, even if responsibility for primary data collection falls to multiple entities
☐ The entity responsible for producing official national energy information maintains a publicly accessible, centralized repository for energy information
☐ Data are uniformly applied across government reporting channels to avoid inconsistencies in different policy documents

D. Guiding questions on each step of the framework

20. The description of each component of the conceptual framework is opened by guiding questions that help the users assess their energy information system step by step (Table 3). Such questions are rather general and could be more finely tuned when targeting the work to any specific country.

Table 3: **Guiding questions for the dimension "PLAN" of the framework**

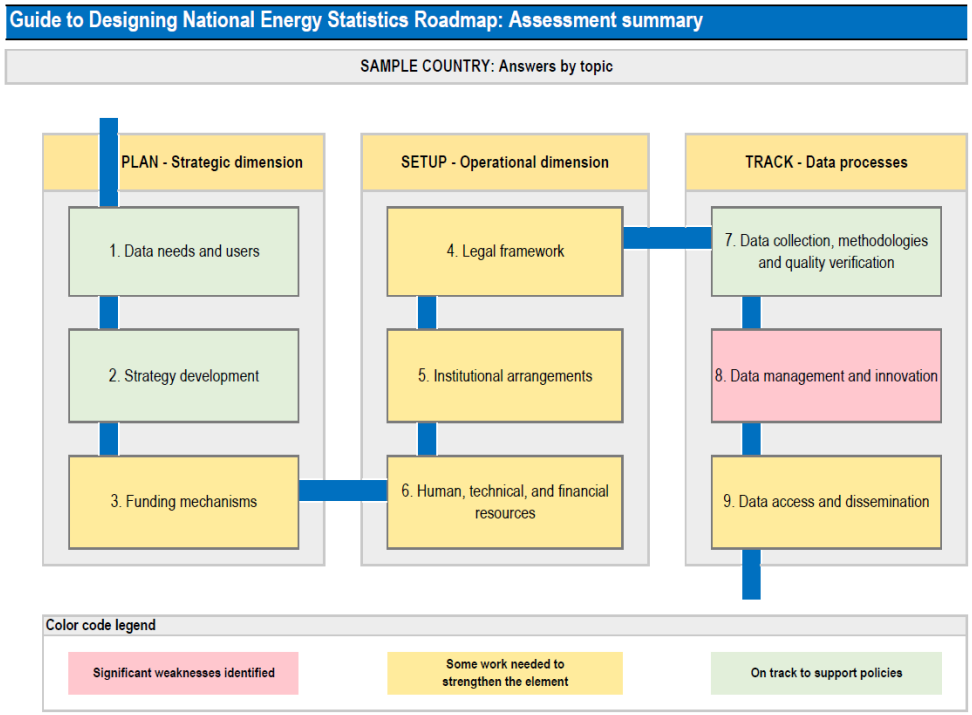
PLAN	Strategic dimension
Data needs and users	What drives the development of energy statistics? Are there relevant or high-visibility energy policies in place that require energy data for policy design and evaluation? Is it clear who the data users are? Are evolving data needs continuously identified and addressed?
Strategy development	Is there a strategy for producing and developing energy data? Who is coordinating it? Does the strategy include identification of data collection priorities? Is it regularly updated to respond to evolving needs?
Funding mechanisms	Are core energy statistics funded by the national administration? Are there additional funding mechanisms besides conventional ones (i.e. public funds)? If so, what do they cover? Are the funding mechanisms sufficient and sustainable for routine and additional work?

E. A self-assessment tool.

21. The IEA Guide is complemented by an Excel-based self-assessment tool, for users to easily apply the framework assessment, step by step, to their national context, by answering the series of guiding questions. The

tool delivers a report (Figure 6), highlighting strengths and weaknesses, which provides a quick description of the national energy information system.

Figure 3: **Output report of the tool. Colours reflects different levels of maturity of individual components**



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IV. CONCLUSIONS: DEVELOPING ENERGY STATISTICS CAPACITY IS KEY

22. Establishing a robust information system serves as a solid foundation for producing sound energy data. Accurate energy statistics ensure that policy makers generate accurate energy indicators – a prerequisite for designing, implementing, and tracking energy policies. The cost of not having reliable energy data is often higher than the cost of investing the required infrastructure for collecting and maintaining the data. As global and national energy agendas and needs continue to evolve, the need for accurate energy data to properly implement and track policies becomes ever more acute.

23. The consolidated experience of the IEA in data collection and validation from across countries worldwide highlights that there are numerous opportunities to improve effectiveness of national energy data, starting from improving the national systems designed to deliver such data. The IEA is keen to support capacity development through training, workshops, bilateral work with countries. Figure 4 shows a session from a recent workshop on the roadmap held in Addis Ababa. The latest IEA Guide, focusing on data governance, adds to several previously released IEA methodological papers and manuals on energy statistics.

Figure 4: **Analysis of stakeholder mapping for energy statistics ("SETUP – Institutional arrangements") at an IEA workshop on "Designing a national energy statistics roadmap" held in Addis Ababa (May 2024).**

24. The IEA Guide to designing an energy statistics roadmap serves as a guide for national policy makers to strengthen their national energy information system and to raise awareness about the importance of having robust energy data. It does so by creating a framework that is easily applicable to the national setting, but which is also pertinent at the regional or sectoral level. It also provides examples of best practices from countries globally, including real-world applications for different elements of the roadmap. The IEA is keen to discuss with national counterparts how to benefit from the Guide and its associated training material.